

***MACROSCOPIC VIEW ON VERTICAL ATMOSPHERIC STRUCTURES***

Wei Wu and Yangang Liu

*For presentation at the*  
Atmospheric Radiation Measurement (ARM) Program  
Science Team Meeting,  
Louisville, KY  
March 30-April 3, 2009

**Environmental Sciences Department/Atmospheric Sciences Division**  
**Brookhaven National Laboratory**  
P.O. Box, Upton, NY  
[www.bnl.gov](http://www.bnl.gov)

**ABSTRACT**

Vertical atmospheric structures (temperature, energy fluxes and entropy fluxes) are investigated by using a simple one-dimensional vertical energy-entropy climate model with an emphasis on macroscopic constraint of atmospheric vertical heat transport. This work focuses on exploring the vertical structures of atmospheric entropy fluxes and their linkages to atmospheric physical framework. For a pure radiation balanced atmosphere, both atmospheric shortwave and net longwave entropy fluxes increase with height. The latter is about one order larger than the former. As a consequence, net atmospheric entropy flux increases with height. In addition, with the same solar energy deposited at each vertical height, darker atmosphere (with thicker longwave optical depth) shows smaller net entropy flux in the whole atmospheric column. It implies that the vertical atmospheric structures intrinsically connect with atmospheric physical framework in a macroscopic way. The variations of the vertical atmospheric structures with different convective adjustments are also discussed.